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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/684,502	10/15/2003	Tomoyo Yamaguchi	244071US2	4605

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EXAMINER	
CHEN, KIN CHAN	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 01/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/684,502	YAMAGUCHI, TOMOYO	
	Examiner	Art Unit	
	Kin-Chan Chen	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,12-14,17,18,25 and 28-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,12-14,17,18,25,28-30 and 33* is/are rejected.

7)☒ Claim(s) *31,32,34 and 35* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 28, 2005 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, and 28 are rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Nishizawa (US 6,617,244).

In a method for plasma treatment, Nishizawa (col. 5, lines 58-60; col. 6, lines 53-55; Fig. 2B) teaches that a substrate including a SiC layer and a SiO_2 layer may be arranged in a chamber. An etching gas may be introduced into the chamber. The SiC layer may be plasma etched. The etching gas may include CHF_3. SiO_2 may be a mask layer on the SiC layer. The base layer of the SiC layer may be a Cu layer. The etching gas may include nitrogen. Since Nishizawa teaches that "a fluorocarbon" such as CHF_3 may be used to etch SiC (col. 3, line 37; col. 6, line 54). Therefore, it is considered to reads on applicant's "as a main fluorocarbon component thereof". Nishizawa also teaches that the flow rate of CHF_3 may be 20 sccm and the flow rate of nitrogen may be 40 sccm (see col. 6, lines 34, 54, and 55; Fig. 3), which is within the instantly claimed range in claim 1.

5. Claims 18 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishizawa (US 6,617,244).

In a method for plasma treatment, Nishizawa (col. 5, lines 58-60; col. 6, lines 53-55; Fig. 2B) teaches that a substrate including a SiC layer and a SiO_2 layer may be arranged in a chamber. An etching gas may be introduced into the chamber. The SiC

layer may be plasma etched. The etching gas may include CHF_3. The etching gas may include nitrogen. The etching gas may also include the inert gas (e.g., argon). Since Nishizawa teaches that "a fluorocarbon" such as CHF_3 may be used to etch SiC (col. 3, line 37; col. 6, line 54). Therefore, it is considered to reads on applicant's "as a main fluorocarbon component thereof". Nishizawa teaches that in the case of the fluorine compound, when an excess amount of organic polymer is not generated in etching, the mixture of the oxygen gas is not required (col. 6, lines 65-67). Nishizawa discloses that **the fluorine compound may be fluorocarbon such as CHF_3 (col. 3, lines 38-42).** Furthermore, since Nishizawa uses same etching gas (CHF_3) for etching same material (SiC) as instantly claimed, it would result in the same amount of organic polymer generated. Therefore, the oxygen gas is not required in the etching gas as instantly claimed because the organic polymer being generated is considered not to be an excess amount. Nishizawa also teaches that the flow rate of CHF_3 may be 20 sccm and the flow rate of nitrogen may be 40 sccm (see col. 6, lines 34, 54, and 55; Fig. 3), which is within the instantly claimed range.

6. Claims 3, 12-14, 17, 25, 30, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishizawa (US 6,617,244) as evidenced by Li et al. (US 6,670,278, Nemani et al. (US 6,764,958), Chooi et al. (US 6,284,657) and Demmin (US 6,635,185).

In a method for plasma treatment, Nishizawa (col. 5, lines 58-60; col. 6, lines 53-55; Fig. 2B) teaches that a substrate including a SiC layer and a SiO_2 layer may be

arranged in a chamber. An etching gas may be introduced into the chamber. The SiC layer may be plasma etched. The etching gas may include CHF_3. The etching gas may include nitrogen. The etching gas may also include the inert gas (e.g., argon). Since Nishizawa teaches that "a fluorocarbon" such as CHF_3 may be used to etch SiC (col. 3, line 37; col. 6, line 54). Therefore, it is considered to reads on applicant's "as a main fluorocarbon component thereof". Nishizawa teaches that in the case of the fluorine compound, when an excess amount of organic polymer is not generated in etching, the mixture of the oxygen gas is not required (col. 6, lines 65-67). Nishizawa discloses that **the fluorine compound may be fluorocarbon such as CHF_3 (col. 3, lines 38-42).** Furthermore, since Nishizawa uses same etching gas (CHF_3) for etching same material (SiC) as instantly claimed, it would result in the same amount of organic polymer generated. Therefore, the oxygen gas is not required in the etching gas as instantly claimed because the organic polymer being generated is considered not to be an excess amount. Nishizawa also teaches that the flow rate of CHF_3 may be 20 sccm and the flow rate of nitrogen may be 40 sccm (see col. 6, lines 34, 54, and 55; Fig. 3), which is within the instantly claimed range.

Claims 3, 12-14, 17, and 25 disclose various layers structures above or below the SiC layers. They are well-known features and merely choices of design, depending on the product requirement. See Li et al. (US 6,670,278 ; col. 4, lines 63 through col. 5, line 1), Nemani et al. (US 6,764,958; col. 7,line 44 through col. 8, line 59), Chooi et al. (US 6,284,657; col. 7, line 52 through col. 8, line 10) in the record as evidence.

The above-cited claims differ from prior art by specifying various compositions and processing parameters (such as ratios of flow rates of etchants in claims 30 and 33). However, same were known to be result effective variables and commonly determined by routine experiment. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality, it is the examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to modify prior art by performing routine experiments by using various compositions and different processing parameters to obtain optimal result. See Demmin (US 6,635,185) in the record as evidence. By using simple extrapolation from Fig. 3 of Nishizawa, it would have been obvious to one with ordinary skilled in the art that when the flow rate of N_2 at 40 sccm, etching rate is100 nm/min. or greater.

Response to Arguments

7. Applicant has argued that Nishizawa does not teach that a ratio of the flow rate of CHF_3 to the flow rate of nitrogen may be between 0.4 and 0.6. In is not persuasive. As has been stated in the office action, Nishizawa teaches that the flow rate of CHF_3 may be 20 sccm and the flow rate of nitrogen may be 40 sccm (see col. 6, lines 34, 54, and 55; Fig. 3), which is within the instantly claimed range.

Allowable Subject Matter

8. Claims 31, 32, 34, and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The primary reason for the indication of allowable subject matter is the inclusion of etching at a rate of from 150 nm/min or greater when a ratio of the flow rate of CHF_3 to the flow rate of nitrogen is between 0.4 and 0.6. Applicant's arguments (page 9, paragraphs 2-4) show unexpected results from this restricted range.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Demmin (US 6,635,185; Col. 7, lines 5-25) teaches that one skilled in the art of plasma etching and cleaning may vary type of plasma etching (RIE, HDP, plasma etching..), composition, flow rate, temperature, pressure, power, time, bias accordingly to etch a desired material satisfactorily.

Li et al. (US 6,670,278 ; col. 4, lines 63 through col. 5, line 1), Nemani et al. (US 6,764,958; col. 7,line 44 through col. 8, line 59), and Chooi et al. (US 6,284,657; col. 7,

line 52 through col. 8, line 10) disclose various layers structures above or below the SiC layers.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

January 20, 2006

Kin-Chan Chen
Primary Examiner
Art Unit 1765